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Global Warming

From The Editor . . .

Increasingly, we are building ever higher performance houses. In the not distant future, most new houses will be net zero energy or very close to net zero. This is happening as a consequence of market demand, changing consumer expectations for comfort, and energy efficiency and regulatory changes.

Inevitably, this evolution generates discussion about how much of the change is driven by the marketplace, and how much by regulation. The answer is somewhere in the middle, as there is a public policy push for more energy efficiency to deal with climate change and energy security issues, and homeowner desire for more comfortable and energy efficient homes.

On the regulatory side where the bar for minimum performance is set, the analysis inevitably is done through an economic window, and that filter is very narrow. In North America we seem to have locked ourselves into analysing everything primarily through an economic filter. It seems that everything has to have a dollar sign attached to it. However, in most cases this is flawed analysis, as we don't have the mechanism, nor do we honestly consider and cost out what economists call externalities.

When we consider the energy impact of construction of a house, we don't really give much weight to the effect of the embodied energy within the construction materials, or the infrastructure needed in the development of those materials. The transportation of construction materials and goods to the site, the roads and the services required by the building all have an impact.

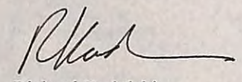
We don't consider the implications of our actions (or non-action) on the environment or other social costs. Decisions are made for many reasons other than cost – just look at the wide variety of vehicles on the road. They all do the same thing – move us and our goods – but under many different nameplates with widely varying costs that we don't really question.

Economic analysis seldom acknowledges that assumptions used are really at best educated guesses – they are actually not much better than crystal ball gazing. Who can say with certainty what the energy prices will be next year, let alone five or ten years from now? Energy prices are influenced by a variety of factors, including local and international political events, taxation and policy decisions, weather, and human activity, such as accidents in the supply lines or other interactions. Yet the first and almost only question raised when higher energy performance is discussed is what is the payback?

However, there is one metric that can be used, but doesn't seem to be in North America, and that is the environmental impact of energy use. In Europe and Asia, the building codes are being drafted on the basis of the carbon impact of the buildings. This recognises that the reason energy efficiency is being regulated is to address the broader environmental issues of global warming.

One jurisdiction in Canada that is making an attempt to deal with this is the city of Vancouver, which has set out a policy to require all buildings built from 2020 onward be carbon neutral. That is their guiding principle in drafting the energy requirements in their building bylaw, to be released next year.

This is something that the rest of the country is going to have to come to grips with, whether we like it or not. More importantly, the issue is how we as an industry come to grips with the coming changes and incorporate the latest high performance technologies in net zero ready homes in a manner that will still maintain our homes' affordability.



Richard Kadulski,
Editor

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Global Warming

Climate change (or global warming) resulting from normal climatic variations or human activity has stirred great debate especially in North America. In the scientific community, there is a strong consensus that global surface temperatures have increased in the last century, largely as a result of human generated emissions of greenhouse gases.

The greenhouse effect was first identified in the 19th century. The gases and particulates (and clouds) in the atmosphere absorb and emit infrared radiation from the earth's surface, resulting in warmer temperatures than would be the case in the absence of the gases, similar to the effect of glass in a greenhouse. The atmosphere keeps our planet 20 to 30°C warmer than it would be otherwise.

The scientific basis for climate change analysis also goes back to the 19th century, when scientists began to analyse the make-up of the atmosphere and global climate systems, and how atmospheric gases impact the climate. The possible impact of human activity on the atmosphere and the overall climate was considered even then, probably because the industrialization of Europe was creating obvious pollution issues.

Scientists have observed that the global average surface temperature has risen about 0.8°C since the late 19th century, with much of that occurring in the last 30 years. The Intergovernmental Panel on Climate Change (IPCC) has indicated that during the 21st century the global surface temperature is likely to rise a further 2 to 4.5°C

Scientific opinion, based on analysis of available data, is that climate change being observed today has been brought about because of human activity. Combustion of fossil fuels, deforestation and industrialized agricultural practices have led to increased concentrations of greenhouse gases in the atmosphere. No national or international scientific body disputes these findings. Even the American Association of Petroleum Geologists updated its statement which had rejected the likelihood of human influence on recent climate with its current non-committal position in 2007 – a backhanded admission that human intervention is having an impact on the climate.

The IPCC stated in January 2001 that "an increasing body of observations gives a collective picture of a warming world and other changes in the climate system... There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities," in particular emissions of the greenhouse gases carbon dioxide and methane.

However, uniquely in North America, there is controversy in the media and within policy circles about the scientific facts of global warming. The controversy concerns the debate over the existence of global warming, its causes and effects, and what to do about it.

Global warming remains an issue of widespread debate, sometimes split along party political lines, especially in the United States and Canada, with Republican and Conservative supporters being more likely to disbelieve the existence and causes of climate change. The largely settled scientific issues, such as the human responsibility for global warming, remain the subject of politically motivated attempts to downplay, dismiss or deny them. The funding sources of those involved with climate science have been questioned by both sides of the issue.

Scientists, especially in the US, have reported official and oil-industry pressure to censor or suppress their work and hide scientific data, with directives not to discuss the subject in public communications. The energy lobby, oil industry advocates and free market think tanks have often been accused of overtly or covertly supporting efforts to undermine or discredit the scientific consensus on global warming.

In 2004, Naomi Oreskes, a geologist and science historian, analyzed 928 abstracts of scientific papers on climate change from refereed scientific journals published between 1993 and 2003. She found that there is scientific consensus on the reality of human induced climate change. It seems that the debate on the authenticity of global warming and the role played by human activity is largely nonexistent among those who understand the nuances and scientific basis of long-term climate processes.

In the interest of "balance," the popular media

in the US and Canada gives more attention to sceptics relative to the scientific community as a whole. A review of media coverage in five major US daily newspapers showed a near even split in the tone of climate change stories. The level of agreement within the scientific community has not been accurately communicated. This coverage differs from that presented in other countries, where press coverage is more consistent with the scientific literature.

However, sowing doubt is a tactic that has been used successfully by some industries in the past (think tobacco industry), and serves the interests of those groups resisting action in preference to the status quo. There is evidence that sectors of the petrochemical industry have been funding disinformation campaigns to sow doubt and encourage a poor understanding of climate change science. They question whether warming trends are really unprecedented or within normal climatic variations, whether it really is human activity, and whether or not it is an issue of inadequate or poor measurements.

Despite the publicity generated by numerous books and movies, including films such as *An Inconvenient Truth*, there is still a low level of understanding and a large portion of the population that doesn't give much weight to the issue. This ambivalence or lack of understanding contributes to resistance among policy makers to come to terms with the difficult decisions that may have to be taken to address the issue.

While it may be too late to reverse many effects of climate change, actions can be taken to limit the damage. Many countries have pledged to limit the amount of greenhouse gases in the atmosphere. Renewable energies, such as wind, tidal and solar energy, are being developed so that we do not need to keep burning fossil fuels

The complexity of the problem, and the long-term impacts makes it difficult for politicians with their short-term world view to deal with the complex issues related to climate change. Unfortunately, difficulty in tackling the problem is universal, although in some regions, valiant efforts are being taken. In Canada, the federal government has actually been reducing support for scientific research into climate change, which is given lip service at best. ☼

Consequences of Climate Change

The IPPC has identified the consequences of climate change. These will vary from region to region around the globe, but on balance will be significantly negative and constitute a serious risk to the health and safety of humanity. One thing that is certain is that Canada will be affected, and it will have impact on the construction industry.

The effects of an increase in global temperature include a rise in sea levels, which will affect several low-lying countries, some of which will disappear from the face of the earth, and in Canada, coastal regions. Changes in the amount of precipitation will include more frequent and intense precipitation and increased flood risk. More extreme maximum temperatures and higher minimums, with more intense and frequent, longer heat waves and possible increases in frequency and intensity of thunderstorms, hail and tornadoes will affect construction detailing.

Although a probable expansion of subtropical deserts may not seem to affect us, it will have effects on global trade and political instability.

Warming is expected to be strongest in the Arctic and would be associated with the continuing retreat of glaciers, permafrost and sea ice. In northern Canada, this will have a severe impact as milder winters will affect transportation routes as permafrost thaws, and drying of soils increases incidence of wildfires.

Other likely effects of global warming include ocean acidification and mass extinction of many species of plants and animals due to shifting temperature regimes. Many plants, which cannot move to find new habitats, are already disappearing from parts of their range, due to drought and higher temperatures. We have already seen consequences in BC, as milder winters have not kept the mountain pine beetle in check, with the result that vast forests have been decimated. This has had severe impacts on the forestry industry, and the eco system.

The Building Code sets out climatic design data for which buildings need to be designed, which are based on approximately 30 years of recorded data. However, codes generally are reactive, so as climate changes and extremes become more so, the values are not captured in the climatic design data until much later. This means that new buildings and infrastructure may not be adequately designed for the more intense weather loads that are forecast. In the near future, codes will have to consider climate change when the codes are being updated.

Industry Action

One industry that already has seen impacts of climate change, and has identified it as a major risk is the insurance industry. The property and casualty insurance industry has even established the Institute for Catastrophic Loss Reduction (ICLR) as a centre for multi-disciplinary disaster prevention research and communications.

The ICLR is an independent, not-for-profit research institute affiliated with the University of Western Ontario with staff and research associates with expertise in wind and seismic engineering, atmospheric science, risk perception, hydrology, economics, geography, health sciences, public policy and a number of other disciplines. Its goal is to provide comprehensive disaster loss prevention advice to homeowners and homebuilders, as well as to owners of small businesses.

Their focus is to help reduce the risk of injury, damage, and interruption of business due to severe wind, hail, earthquakes, flood, wildfire and a number of other hazards. They are also working to promote the construction of disaster resilient homes.

The ICLR has also published *Climate change information for adaptation: Climate trends and projected values for Canada from 2010 to 2050* which documents observed trends over the past 50 years and projections of predicted climate change for the next 40 years, by region. It includes regional information on temperature, precipitation, wind, riverflow, sea level changes, glacier retreat, lightning, forest fires, drought, and permafrost. It provides useful information for policy makers and anyone looking at planning for future-proofing infrastructure.☼

You Asked Us About Stucco and Weather Barriers

We have been building homes using the airtight drywall approach (gasketed drywall) and house wrap on the exterior walls. We now have a home under construction that will be finished with stucco, and our stucco sub-contractor does not want us to use the house-wrap material. What would the best product to use for this application?

KD
Vernon, BC

If you are building using airtight drywall, with interior gaskets and sealants, then you don't have to rely on a house wrap as an air barrier. You could stick to more traditional sheathing paper, such as a double layer 30 min paper.

If you do want to use a house wrap product and tape and seal all the joints to make that part of your air barrier, and your stucco guys aren't comfortable with the house wrap, you should use a rainscreen approach. The rainscreen gap would create the separation from the house wrap to deal with any moisture that might penetrate the exterior cladding.

The reaction of your stucco contractor is based on a reasonable concern. Regardless of the exterior cladding, there should always be a capillary break between the exterior cladding and the sheathing – it's good building practice.

Investigations in coastal BC in the late 1980s, in the wake of the leaky condo crisis found that without a capillary break, water could penetrate the house wrap and wet the sheathing behind. It was discovered that once a house wrap has been contaminated with surfactants, such as acrylic additives in the stucco mix or oils in wood siding or paint, it no longer is water repellent. Especially when there is no capillary break, the capillary forces will draw the contaminated water until all voids are saturated. The water is absorbed into the wood fibres through capillary suction, much like the small pores of a sponge that absorb water. Wood fibres hold the water so that over time, the water will allow decay mechanisms to work leading to deterioration of the structure.

However, if there is a capillary break (i.e. a rainscreen) then any moisture penetrating the exterior cladding, be it stucco or siding, will not see capillary forces, and will have a chance to drain and dry out, minimizing moisture loading of the structure.

Whither Housing Research?

Canada has an enviable heritage in housing research. Our world-class housing being built today is a reflection of many years of research, a disciplined, transparent and science-informed development process of standardised codes and training for the industry. The Division of Building Research (DBR) in the National Research Council (NRC) was created in 1947 to provide scientific data for all fields of construction, including building materials, types of construction, layout, and all other essential features and has been a trusted source of building science for the construction industry.

The DBR had a series of regional offices and representatives who had a hands-on familiarity with construction practices and were able to help builders, designers and authorities with issues that arose. They also were able to provide researchers with current information on issues that required research. DBR publications, especially the Building Digests, are still a go-to reference and text for building science research.

Although DBR no longer exists under that name, construction research has been a part of the National Research Council's activities since the 1940s. Recently, the strategic direction of NRC has been shifted to an emphasis on commercially-valuable research, which can put limits on research activity, and the release of research findings.

When it was created as Canada's national housing agency, CMHC was also given a mandate to undertake and support research – technical and socio-economic – aimed at improving the quality of Canadian housing. It has become a leading source of objective, reliable housing information.

CMHC also has worked in close collaboration with provincial and regional governments and the housing industry to enhance Canada's presence in the global marketplace, and share our housing experience and expertise with the world.

CMHC has worked closely with the National Research Council and other organizations on research and produced information useful for designers, builders and homeowners. When issues arose that had significant industry implications, they were prepared to help investigate the issues, and then to translate the research. CMHC's Research Division has been responsible for some very important construction research. It was responsible for translating information into extremely valuable documents such as the Canadian Wood Frame Handbook, a series of Best Practice Guides, and documents on healthy housing and indoor air quality. However, with budgetary cutbacks, research is being severely curtailed, and valuable publications are being withdrawn.

The challenge for the housing industry is that, although it represents about 20% of the GDP, and employs hundreds of thousands of workers, it doesn't have the resources to undertake research and development within a corporate umbrella. Unlike other industries, with large vertically integrated industrial corporations that can undertake a significant share of research internally, the housing industry is comprised of thousands of small companies. That is why the downsizing of CHMC's research division and changes at the National Research Council are of great concern as they will have a large impact on the housing industry. The cutbacks are significantly reducing the capacity for meaningful housing research.

Already, CMHC has withdrawn some significant publications because they will not support them, nor provide resources for updating them. For builders and designers, the Best Practice Guides are of particular interest, as they provide state of the art construction information. But there are other documents, such as on indoor air quality and healthy housing that will no longer be available, except in a few libraries that may still have copies in their collection.

And of course, on-going research reports and items that will be fading – although the list of potential research projects needing attention has not diminished, as can be seen on the CHBA technical research committee's list of research projects. The list of research highlights – one of the barometers for tracking research projects – has shrunk in the past few years. Publicly funded research is important because it makes it possible to undertake the research and ensures that the findings are publicly available.

Research is not something you do once and call it a day. Otherwise we'd still be driving around in Model As and living in drafty underinsulated houses. We live in a high-tech world dependent on research. Much of what we live with, whether it is tools, appliances or entertainment, is the result of ongoing research – sometimes far removed from the perceived objectives of the original research projects from which they emerged.

Ever-changing circumstances require that ongoing research be carried out. It leads to progressive improvements in technology and problem-solving as issues arise. We are at a stage in Canada where we are starting to fall behind the rest of the world as research budgets get curtailed. The consequence is that rather than being innovators and providers of the best homes in the world, and being able to seek international commercial opportunities to export our technology to others, we end up being at the mercy of others, importing their ideas and technology (sometimes ideas originating in Canada) and we lose the capacity to maintain a vibrant up-to-date industry.☼

Rain Screen Mounting Plates

Detailing for penetrations in the exterior wall, to minimize water penetration, presents a challenge for designers and builders. Electrical outlets, lights, and hose bibs have to be accommodated on exterior walls, but they cannot break the continuity of the water shedding protection of the cladding, and must not allow the entry of water.

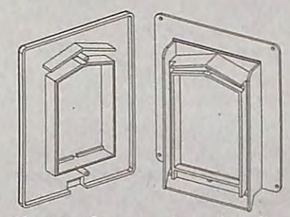
Often, this entails a combination of flashings and mounting plates that can be quite unsightly. Unless they are meticulously detailed and built they are vulnerable to water penetration. Manufactured mounting plates that provide a flat working surface, and prevent water intrusion around openings are showing up on the market.

A BC company founded by former homebuilders and siding contractors, has designed siding accessories using their hands-on experience combined with the latest rainscreen knowledge. Their mounting plates, for lighting, electrical outlets, and hose bibs and blank plates for points of attachment, are designed with a rainscreen channel to divert water away from the siding, and prevent water intrusion onto the sheathing, eliminating the necessity of caulking and separate flashings, at the same time providing an attractive cover plate.

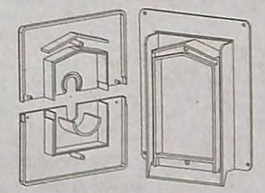
The polypropylene mounting plates are compatible for use with vinyl, cement board or wood, and adjust for cladding thicknesses from ½" to 1" thick. They are available in several colours.

Other products from this company include flashing end dams, soffit screens and starter strips.

Raindog Building Products
Tel: 778-298-8878
www.raindoginc.com



Electric plug mounting plate for 2¼" x 3½" receptacle.



Split hosebib or pipe mounting plate – sized for ½" pipe.

In Memoriam – Don Onysko

It is with sadness that we must report the passing of Don Onysko on Sept. 9, 2012 after a long illness. Don had a quiet, steadfast and determined passion for the correct use of timber in buildings. He was recognized as an authority on wood technology and had a great influence on many people in the building research and construction communities. He had an enduring passion for research in building science, always testing theory and technical knowledge against what happened on site.

He had a way of finding the good in people and looking for humour at every opportunity.

He was generous with his knowledge, always ready to answer any queries. Much of what we know about wood and its performance in houses we learned from Don Onysko. He was a contributor to the TRC and will be missed very much.

Window installation

Windows and their installation is a major detailing problem in construction because the window-wall connection is often the source of moisture entering into the building envelope.

Observations from investigative work and research have found that during its service life, the window rough opening will get wet. There will be some water accumulation at the windowsill, so that the details must allow for that moisture, and must allow it to drain and dry out.

Across Canada, there are two general types of windows: those with mounting flanges, and those without. Flanged windows are common in many parts of the country. The flanges on the window frame are designed as elements to facilitate mounting the units. However, they are also often treated as flashings but that is not what they are designed for.

The National Research Council developed a procedure to assess how well window/wall details commonly used in Canadian practice deal with the penetration of rainwater into a wall assembly. They did multi-year laboratory research work using standard construction detailing methods or variations of best practice with a series of window types. Results of the performance of each wall assembly were intended to be used by CMHC to develop a best practice guide for window installation. Regrettably, there is still no decision on when or whether a best practice guide is to be published, although a few research papers have been published, and NRC researchers have done some presentations to research and industry groups.

Several approaches to seal the joints between the window and the wall against water ingress were examined. One commonly used detail, and one that has been promoted by home warranty companies, is to seal the back of window flange against the sheathing membrane. A generous bead of polyurethane caulk is applied to the sheathing paper ¾" out from the opening to jamb and window head or onto the nailing flange itself so that the flange is sealed. The windowsill is left un-caulked to allow for drainage.

A second detail, often seen at least on the West Coast is the application of a strip of self adhered flashing membrane over the joint between window flange and sheathing membrane (but not at the window sill).

Continuity of air barrier

Continuity of the air barrier is important. The pressure difference between inside and outside and where in the assembly it is felt, will affect water penetration and accumulation. Current practice aims at sealing joints that can get wet – the joint between window frame (flange) and the sheathing membrane.

Test results found that the typical detail for sealing the perimeter of the window flange to the sheathing membrane creates a plane of high resistance to airflow on the exterior of the assembly. A high pressure drop across an imperfect interface will mean that any water at this boundary will result in the moisture getting sucked further into the wall assembly through small gaps and imperfections. Pressure differences will drive water through the interface seal, resulting in higher water accumulation on the rough opening sill.

For durability and best performance, the wall-window airseal should be located on the interior of the wall assembly. The location of the higher pressure drop (the air barrier) should be further inside towards the interior wall window detail so that it can be kept dry. The first and second line of defence against water penetration should not be the most airtight layer. A looser seal towards the exterior will reduce the amount of moisture penetration, and with proper moisture shedding detailing, will reduce moisture impacts on the assembly.

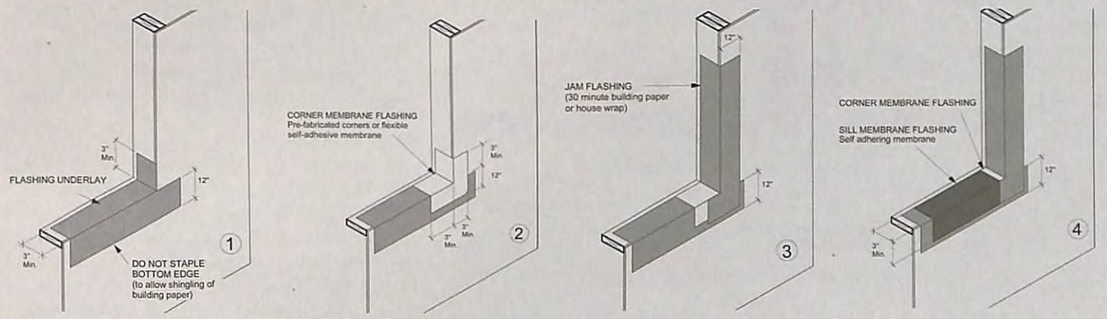
Weather barriers

In addition to the air barrier continuity, weather barrier installation must be done carefully. Proper lapping of all elements is essential – all elements must be shingle lapped to the outside to remove any water that penetrates the cladding. The tests showed that 'fish mouths' and reverse lapping allowed water ingress.

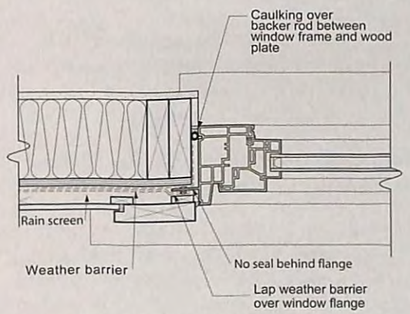
The rough sill flashing needs to lap over the sheathing membrane. The sheathing membrane must lap over the drip cap head flashing. The membrane on the rough jambs must lap over the corner upstand of the sill flashing. Reverse lapping can channel water behind the plane of water resistance and risk of damage increases. The sequence is shown in the illustration.

Properly designed, the rough windowsill should be sloped, with a back-dam on the interior, against which the window is installed. ☼

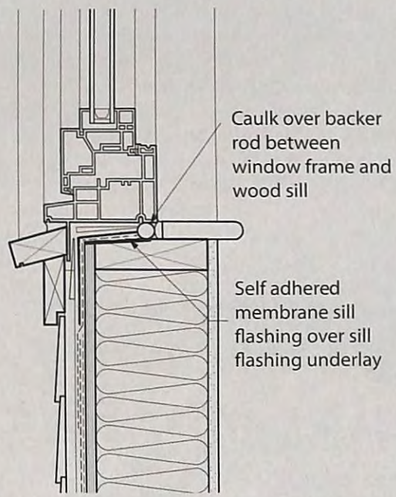
Imperfect seals + water + higher pressure differences = high risk of driving water through the joint



Preparing the window rough opening is equally important – weather barrier membrane needs to be installed in sequence and properly lapped. Manufactured corner flashings help make corner details watertight.


Caulking over backer rod between window frame and wood plate
Rain screen
Weather barrier
No seal behind flange
Lap weather barrier over window flange

There will be a pressure difference between the exterior and interior – especially during windy weather. There will be a lower pressure drop across a wetted but vented exterior plane, when there is a tighter air seal towards the interior – this will result in less water penetrating the assembly, and less on the rough opening at the windowsill.
The air seal towards the interior is protected and consequently is a more effective and durable seal.


Caulk over backer rod between window frame and wood sill
Self adhered membrane sill flashing over sill flashing underlay

Window sill detailing must allow for drainage – secondary sill flashing must be installed behind window sill.

Window-wall Interface – Lessons Learned

- The rough opening will get wet – drain it out.
- Water enters at the windowsill
- Water accumulation at windowsill must be drained
- Flash and drain the rough opening
- Provide drainage path to the outside
- Sequencing is critical
- Manufacturers need to focus on the design of the installed window, including the interface with the wall
- Windows need to be installed with redundant assemblies
- Designers need to increase their focus on interface detailing, including considering the continuity of all the critical barriers
- Installers need to have more understanding of the design strategy

Canadian Home Builders' Association

Technical Research Committee News

Codes and Standards

Code issues continue to dominate the TRC agenda despite the desire to focus more on the research side. The occurrence of unintended consequences from new regulations is of continuing interest. CHBA is trying to document examples in order to find ways to predict and hopefully reduce them in future.

CHBA will also be keeping an eye on related initiatives about to get underway jointly between the Canadian Commission on Building and Fire Codes (CCBFC) and the Provincial Territorial Policy Advisory Committee on Codes (PTPACC). One will review the effectiveness of the codes development process and the other will review harmonization of technical differences between the various provincial and national codes. This is of importance, as we've seen various jurisdictions across the country significantly modify codes.

National Building Code - 2010

Illustrated Guide to Part 9 of the 2010 NBC

The User Guide to Part 9 of the National Building Code (last published in 1995) and the 1998 Illustrated Guide to Part 9 of the NBC are being updated to pick up the changes in the latest editions of the code. This is to be published as a single illustrated guide to Part 9. The document has largely been drafted and is now being reviewed by staff for technical and editorial content to match the 2010 NBC. The document will include a new chapter on energy efficiency to reflect the new energy efficiency requirements that are coming.

Energy Efficiency Requirements

The new energy efficiency requirements were approved by the Canadian Commission on Building and Fire Codes (CCBFC) in June 2012. They are now being formalized and translated, and are slated to be published as interim changes to the NBC in late 2012.

The codes centre is now working on an adaptation guide to help provinces adapt the energy efficiency regulations.

At this time, Nova Scotia, New Brunswick and BC have indicated that they will adopt the new NBC requirements, with some minor tweaks. Manitoba already has adopted standards that are similar to the new NBC requirements.

Alberta has indicated that they will adopt NBC Pt 9 energy efficiency requirements in the summer of 2013 with no changes.

Ontario and Quebec have developed their own energy efficiency regulations that differ from the NBC.

New B55 Standards Verify DWHR Performance and Safety

Drain water heat recovery units (DWHR) can save consumers up to 35% in water heating costs by using outgoing, warm drain water to pre-heat incoming, cold fresh water. They can be used in new construction and renovations.

CSA has published two standards. They verify manufacturers' claims on system performance and provide a level playing field for product promotion .

CSA B55.1-12 Test Method for Measuring Efficiency and Pressure Loss of Drain Water Heat Recovery

This standard applies to DWHR units of any diameter, length and configuration for use with potable water, and to components and materials supplied by the manufacturer, assembly and installation instructions, and operation after assembly in accordance with instructions. This standard does not apply to site preparation or installation procedures.

CSA B55.2-12 Drain Water Heat Recovery Units

This standard specifies requirements for the durability and safety of vertically installed, drain water heat recovery (DWHR) units.

Illustrated Guide for Seismic Design of Houses

Lateral Bracing Requirements, Part 9 BC Building Code 2012

Changes to the National Building Code are introducing new, more stringent, structural design requirements for seismically active areas. They apply primarily to coastal areas of BC.

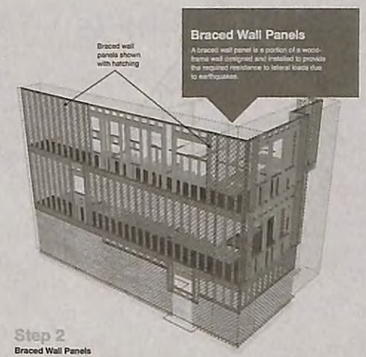
The changes will have significant impact on home design. The requirements will improve the seismic response of a house and ensure a higher level of safety in the event of an earthquake. The principles for seismic design have benefits not just for structures located in seismically active regions, but also for locations subject to high wind loads.

Something worth keeping in mind is that the effects of global warming are predicted to include more severe storms events, so if we want to plan for the future, it will be important to carefully review the structural design of our buildings.

The Homeowner Protection Office in BC has published an illustrated guide to assist house designers and builders understand the new lateral bracing requirements, which will come into effect in the BC Building Code early in 2013.

The 28-page guide explains the new requirements using a step by step process. It has full colour, 3-D, illustrated graphics to help explain the concepts, and provides a flow chart and helpful checklist of design requirements. It also addresses exceptions and trade-offs for greater design flexibility and construction.

The guide is available free of charge, online at *hpo.bc.ca* (look for publications).


Braced Wall Panels
A braced wall panel is a portion of a wood-frame wall designed and installed to provide the required resistance to lateral loads due to earthquakes
Braced wall panels shown with hatching
Step 2
Braced Wall Panels

Exterior Water Management: Building Envelope Seals

A major challenge for achieving watertight and airtight building envelopes is penetrations through the exterior of the building. Every house has its share of ducts, conduits and cable penetrations that need to be sealed – often not too successfully. Common approaches include using caulking, spray foam insulation, rubber gaskets, and even construction tape.

Building Envelope Seals

An Edmonton company has come up with an interesting, labour saving and effective new 17 ml thick polyethylene gasket that makes sealing of common penetrations easy. The preformed gasket, called *Greenskin™ Building Envelope Seal* comes in a variety of sizes to accommodate electrical, plumbing and HVAC penetrations without the need for caulking or taping.

The Greenskin seal fits over the penetration forming an airtight seal at the plane of the sheathing and weather barrier. The dimpled sheet creates a capillary break between the seal and the sheathing against which it sits. As it is not a stretchy material, the correct size has to be selected and they manufacture a number of sizes. The house weather barrier is then fit around the seal, tucked under below the penetration, and over the seal from above.

This is a newly launched product, as a sideline to the company's main business manufacturing a range of plumbing valve products, so they don't have it shown on their website, but there is an installation video on Youtube (*GREENSKIN Presentation-Mobile.m4v*).

Information:
Mainline Backflow Products
Tel: (780) 413-7204
Toll Free: 1-877-734-8691
www.backwatervalve.com

Greenskin seals are semi-transparent. They are installed over the penetration, then the weather barrier is lapped over the Greenskin, forming a shingled barrier to shed any moisture.

Energy Intensity Of Water

Water is essential for life. Water availability and supply versus demand is emerging as the next big issue to be confronted. Access to safe drinking water is a challenge in some parts of the country, especially in rural and more remote communities. In other parts of the country, and in major metropolitan areas, population growth has put pressure on available resources. Because of the importance of water and the health issues related, a lot more research needs to be done.

To address many of these issues, the nature of water infrastructure is going to be changing, with more water recycling through grey water reuse and water treatment at the micro scale. CMHC has supported a number of projects and initiatives to promote residential water reuse within Canada, as well as research related to onsite wastewater management. Standards for small-scale water treatment and grey water recycling are being fine tuned now. However, there are limited resources for it, and funding cutbacks are restricting work in this area.

In a recent study, the American Society of Civil Engineers (ASCE) documented that capital spending has not been keeping pace with needs for water infrastructure. If current trends continue, the resulting gap will only widen through 2040. As a result, pipes will leak, new facilities required to meet stringent environmental goals will be delayed, operations and maintenance will become more expensive and waters will be polluted. While their study focuses mainly on the US situation, conditions in Canada are not significantly different.

As the ASCE study states, there are many ways to partially offset these negative consequences. Possible preventive measures include spending more on existing technologies, investing to develop new technologies and then implementing them, and changing patterns of where and how we live. All these solutions involve costs. Separately or in combination, these solutions will require actions on national, regional, and private levels, and will not happen automatically.

Water-related issues are also responsible for 50% of home insurance claims, be it infrastructure failures, accidents or weather-related disasters. The insurance industry is taking a keen interest in looking at areas that have issues with inadequate infrastructure.

More than half the water we use today is used by agriculture and industry. We are consuming much more water than we see delivered through the pipe to an individual building. Although in Canada we have vast numbers of lakes and rivers, with seemingly unlimited resources, access to water is not unlimited.

We have become aware of the concept of "embodied energy" for construction and building materials. This reflects the resources required to manufacture and install the materials. The concept of energy intensity of water will gain a higher profile in the future. Knowing the energy intensity (kWh/unit of water) of a water system is one of the first steps to proper design and management of a water system that can optimize freshwater use and protection in conjunction with energy and carbon emissions reductions.

The energy embedded in water systems is highly variable and needs to be determined on a community-by-community basis. Water systems that rely on more than one water supply often have different embedded energy values throughout the year, depending on which source is being utilized at the time of use.☼

Energy Answers

Rob Dumont

How much electrical energy does it take to energize an electric car?

I spoke recently with Brent Veitch, a Saskatoon-based electrical engineer who has converted a Toyota Prius to operate as a plug-in electric car. Brent's estimate is that one kilowatt-hour of electricity will yield about 4 kilometres of travel for that size of car.

The average car in North America travels about 20,000 km per year. For an electric car, it would take about 5,000 kWh per year to provide the energy for that distance. Here in Saskatchewan, the average annual electricity usage per household for LAME (Lights, Appliances and Miscellaneous Electricity) is about 9,000 kWh per year. Thus putting a lot of electric cars on the road would add considerably to the residential electrical load.

What are some of the practical models of electric cars, given that at the moment there are very few public electric car charging stations?

I am aware of two options. GM produces the Chevrolet Volt, which has a gasoline engine in addition to the electric motors. If the batteries for the electric motor are depleted, the gasoline engine automatically starts. Thus "range anxiety" is overcome.

Toyota also produces a viable option, the Prius (PHEV) Plug-in Hybrid Electric Vehicle which has both an electric motor and a gas engine.

My wife and I have a 2008 Prius, and can get about 700 km on a full tank of gas. I suspect that the PHEV would have a similar range once the electric motor batteries are depleted.

Nissan produces the LEAF all-electric car, which does not have a gasoline engine and thus is range-limited.

Sales of the GM Volt, the Prius PHEV and the Nissan Leaf are growing. As of September 2012, 16,348 GM Volts, 7,734 Prius PHEVs and 5,212 Leafs had been sold. The U.S. government has targeted a market of one million such vehicles by 2015.

How much does energy cost per kilometre for an electric car, and how does it compare with gasoline for an efficient car?

In Saskatchewan, electricity costs about 11 cents per kWh, and at 4 km per kWh, the energy cost works out at 2.8 cents per km. The current price of gasoline locally is about $1.30 per litre, and our gasoline-powered Prius averages about 5 litres per 100 km. Thus the cost per km for gasoline for the Prius is about 6.5 cents. 6.5 cents per km is obviously more expensive than 2.8 cents.

Electric cars are coming.

The bottom line is that for energizing cars, electricity is less than half the price of gasoline given current prices in Saskatchewan.

The capital cost of these electric vehicles is currently relatively high. The GM VOLT has a price of $US 39,145. In the U.S., the monthly lease payment is much more modest at $299.

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NRC·CNRC

National Building Code energy requirements for houses to include alternative path for demonstrating compliance

By Mihailo Mihailovic

Mihailo Mihailovic is a technical advisor in the Codes group at NRC Construction.

With the upcoming publication of new energy efficiency requirements for houses as an interim change to the National Building Code of Canada (NBC) 2010, users will have a new option for demonstrating compliance.For the first time ever, Part 9 of the NBC will offer a compliance path using calculation procedures or simulation tools. It's called the performance path.

This opens the door for those wishing to lead the industry with new and more efficient housing construction methods or systems. The performance path compares the simulated energy use of a proposed house design to the energy used by an identical reference house designed to meet the prescriptive provisions of the Code. If the simulation shows that the proposed house uses the same amount of energy, or less, than the reference house, it is deemed to comply with the Code.

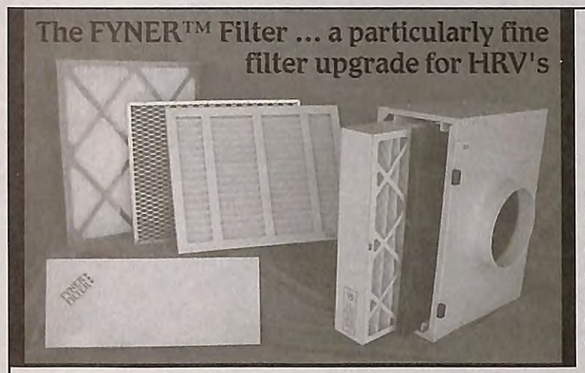
For this edition of the NBC, the performance path can be used for houses and buildings that contain only dwelling units where the common space is less than or equal to 20% of the building's total floor area. All other building types falling under Part 9 will have the option of using the performance path available in the National Energy Code of Canada for Buildings 2011.

The new performanceprovisions are located in a separate subsection and include a list of calculation rules as well as default parameters and values for input into simulation tools. No particular software tools are prescribed: the choice is left up to the user. The development of the performance path is, however, based on the default values and calculation procedures used in the Natural Resources Canada (NRCan) HOT 2000 program, which means that comparison and use of data produced for its EnergyStar and R2000 programs should be relatively seamless. NRCan will provide guidance on how to use HOT2000 for code compliance using the performance path in NBC Part 9.

The input parameters for the proposed house are based on the design that would be submitted to the authority having jurisdiction during the permit stage. The proposed design could include use of advanced construction technologies with the user securing a credit for increased energy efficiency via the performance path. The input parameters for the reference house would use the prescriptive requirements for the applicable climate zone found in Section9.36of the NBC. The insulation, HVAC systems and service water heating systems of the reference house would, however, match those of the proposed house. For example, if the proposed house uses a wood-frame structure with masonry veneer cladding, the reference house would use the same. In some cases, however, certain assumptions must be made. The following table provides some examples:

Using the performance path to comply with NBC energy efficiency requirements also has implications for the permit approval process. Designers or builders wanting to use the performance path will now need to include specific information in the drawings and specifications submitted for the permit application that would allow the authority to compare the proposed house design to the input parameters used in the performance calculation.A corresponding energy performance compliance calculation report would also be required, containing a summary of the house characteristics, the annual energy consumption of all energy sources calculated for the proposed house and the house energy target of all energy sources calculated for the reference house.The simulation and related reports could be prepared by anyone with experience in energy simulation analysis. The NBC lists specific requirements for the report in its Division C administrative provisions.☼

Issue	Reference House
Ratio of fenestration and doors to gross wall area (FDWR)	If proposed FDWR is <17%, set to 17%
	If proposed FDWR is between 17% and 22%, set to match proposed
	If proposed FDWR is >22%, set to 22%
Heating, ventilating and air conditioning equipment	If proposed type is listed in Table 9.36.3.10, use the same as the proposed system at minimum performance level
	If proposed type is not listed in Table 9.36.3.10, set to gas-fired warm-air furnace with 92% AFUE
Tankless service water heating equipment	If proposed system is gas tankless, set to gas storage type at similar input capacity
	If proposed system is oil tankless, set to oil storage type at similar input capacity
	If proposed tankless type is not listed in Table 9.36.4.2., set to gas storage type of ≥22kW capacity with a thermal efficiency Et≥80%



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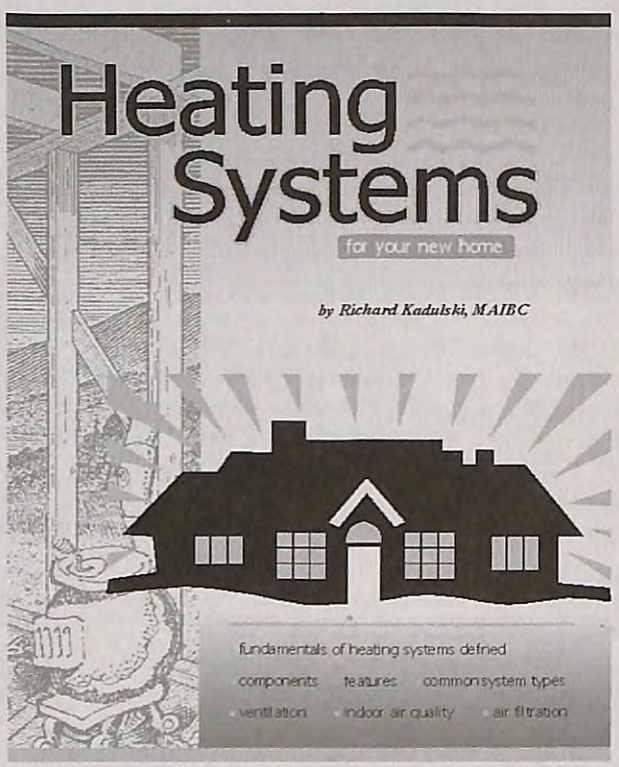
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